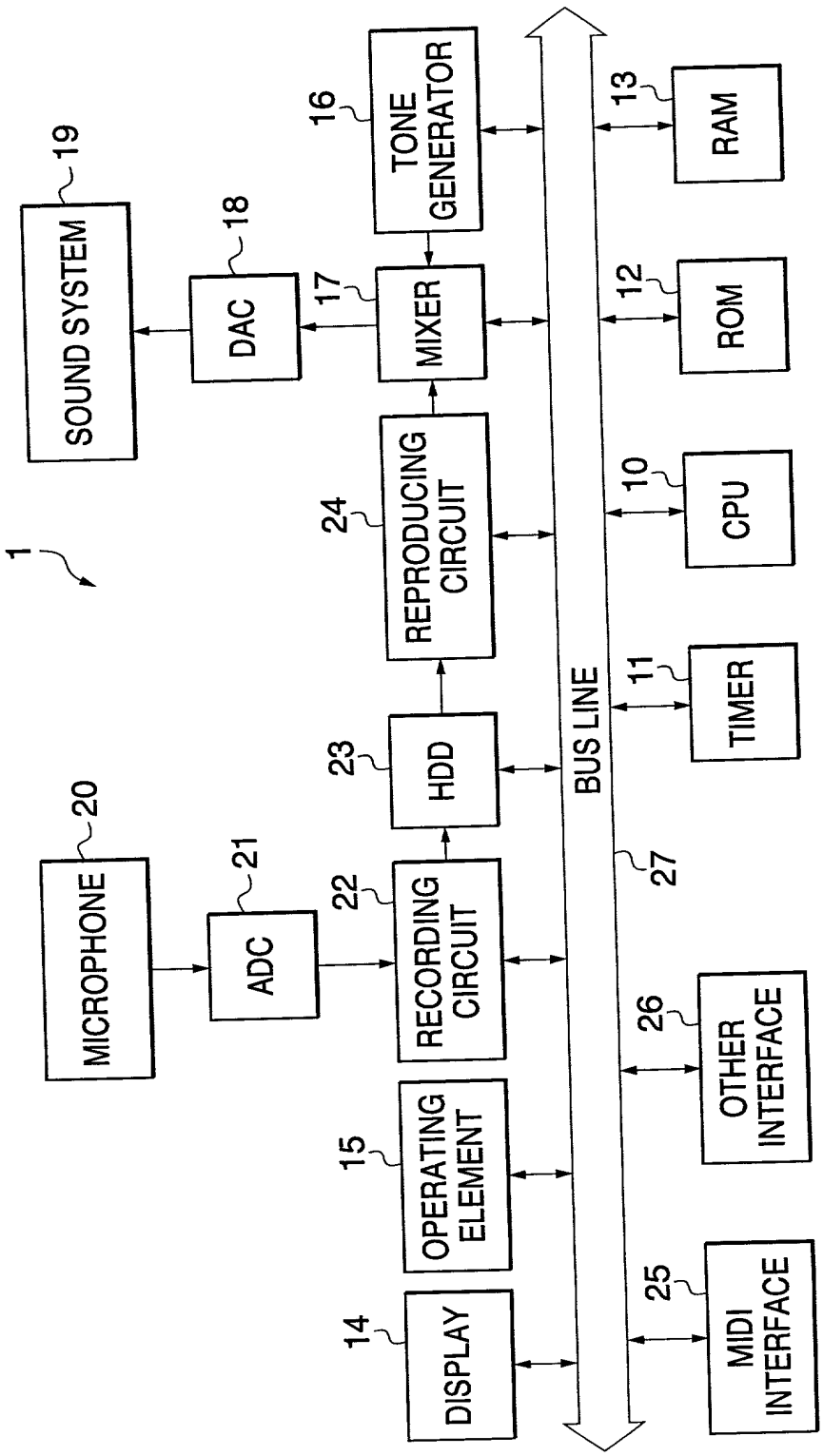
FIG. 1


1
SOUND SYSTEM
19
DAC
18
MIXER
17
TONE GENERATOR
16
REPRODUCING CIRCUIT
24
HDD
23
RECORDING CIRCUIT
22
ADC
21
MICROPHONE
20
OPERATING ELEMENT
15
DISPLAY
14
BUS LINE
27
RAM
13
ROM
12
CPU
10
TIMER
11
OTHER INTERFACE
26
MIDI INTERFACE
25

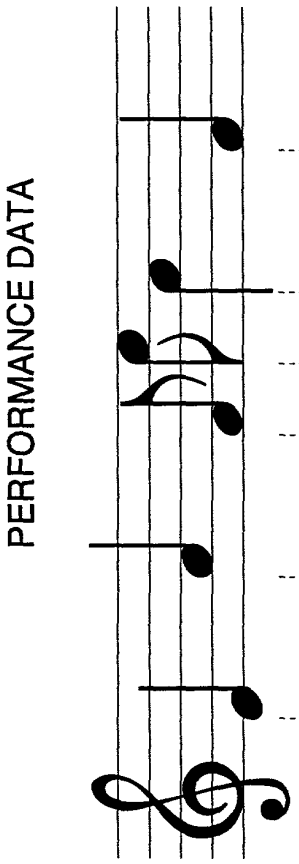


FIG. 2A

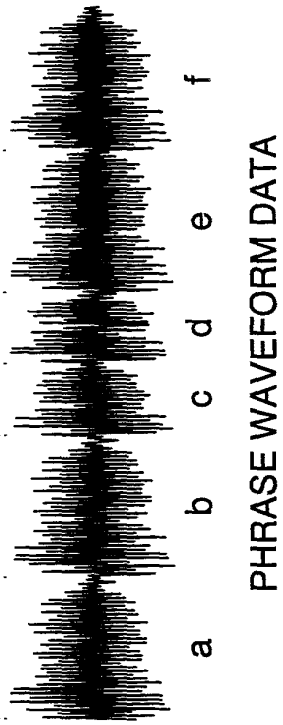


FIG. 2B

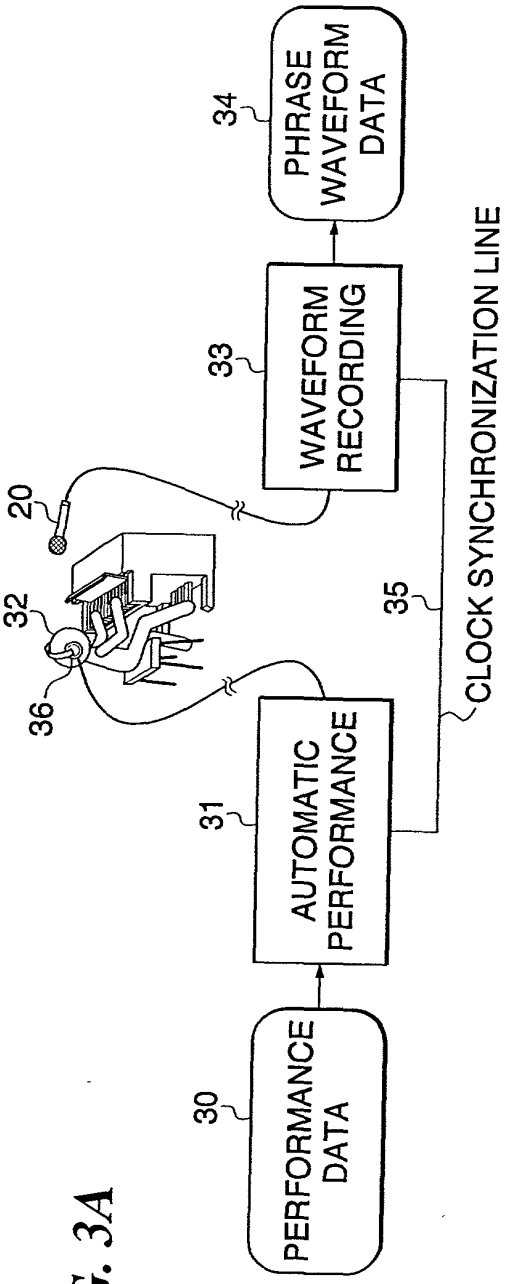

PERFORMANCE DATA
30
AUTOMATIC PERFORMANCE
31
WAVEFORM RECORDING
33
PHRASE WAVEFORM DATA
34
CLOCK SYNCHRONIZATION LINE
35
20
32
36

FIG. 3A

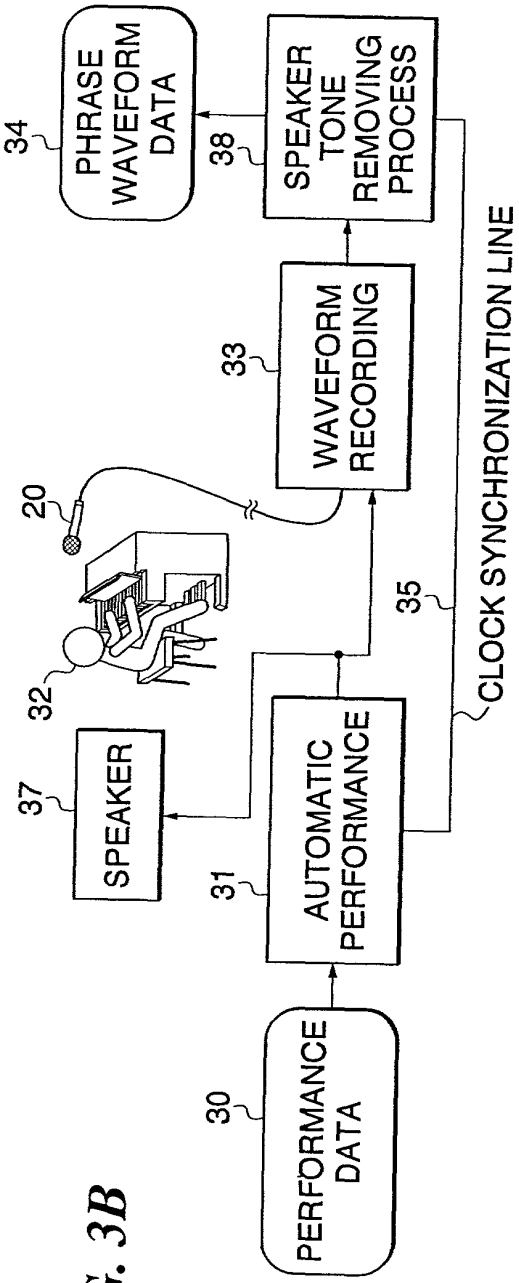

PERFORMANCE DATA
30
AUTOMATIC PERFORMANCE
31
SPEAKER
37
WAVEFORM RECORDING
33
SPEAKER TONE REMOVING PROCESS
38
PHRASE WAVEFORM DATA
34
CLOCK SYNCHRONIZATION LINE
35
20
32

FIG. 3B

FIG. 4

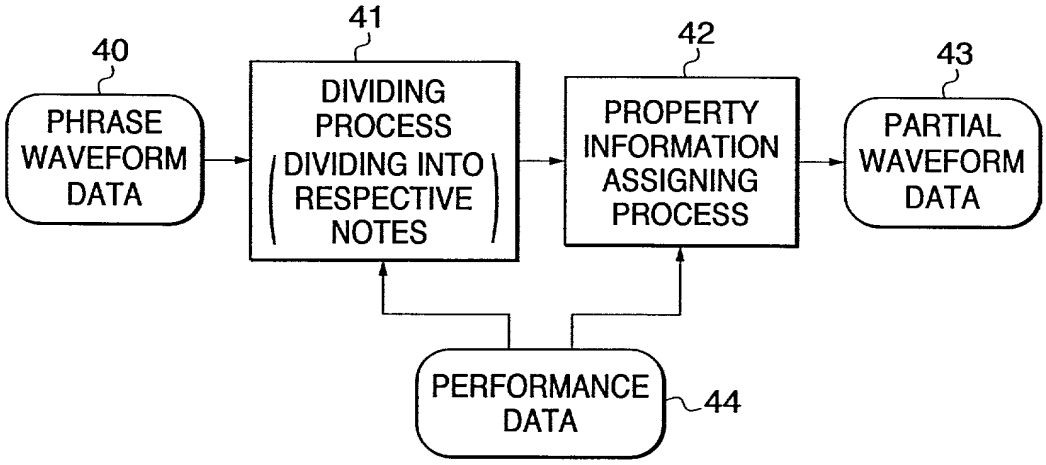

40
PHRASE WAVEFORM DATA
41
DIVIDING PROCESS (DIVIDING INTO RESPECTIVE NOTES)
42
PROPERTY INFORMATION ASSIGNING PROCESS
43
PARTIAL WAVEFORM DATA
PERFORMANCE DATA
44

FIG. 5

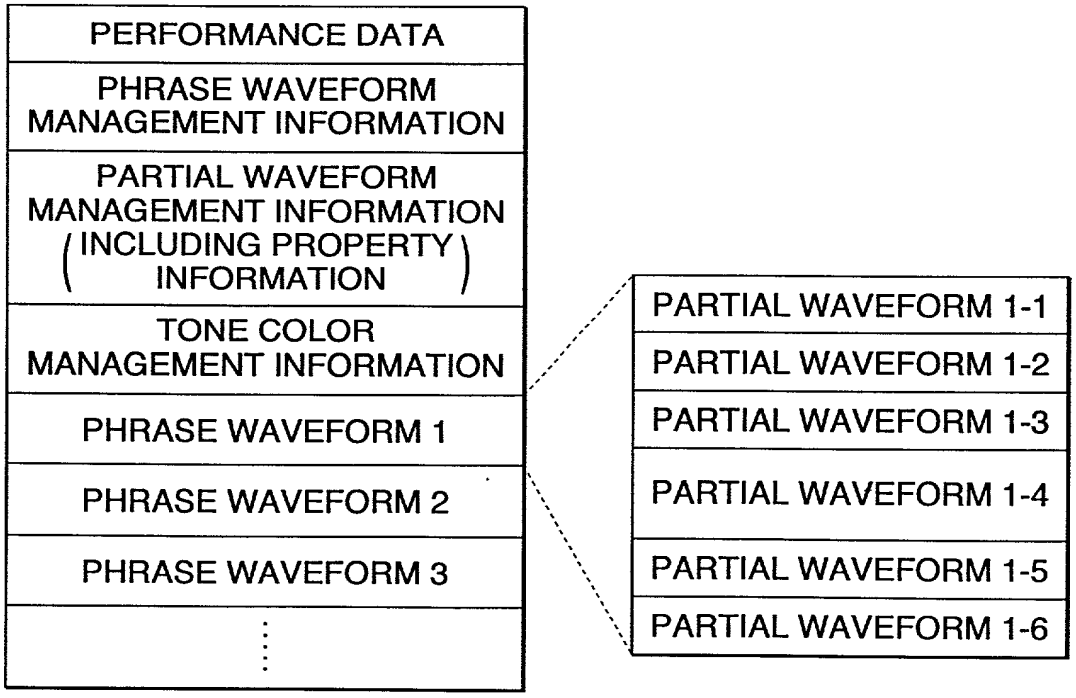
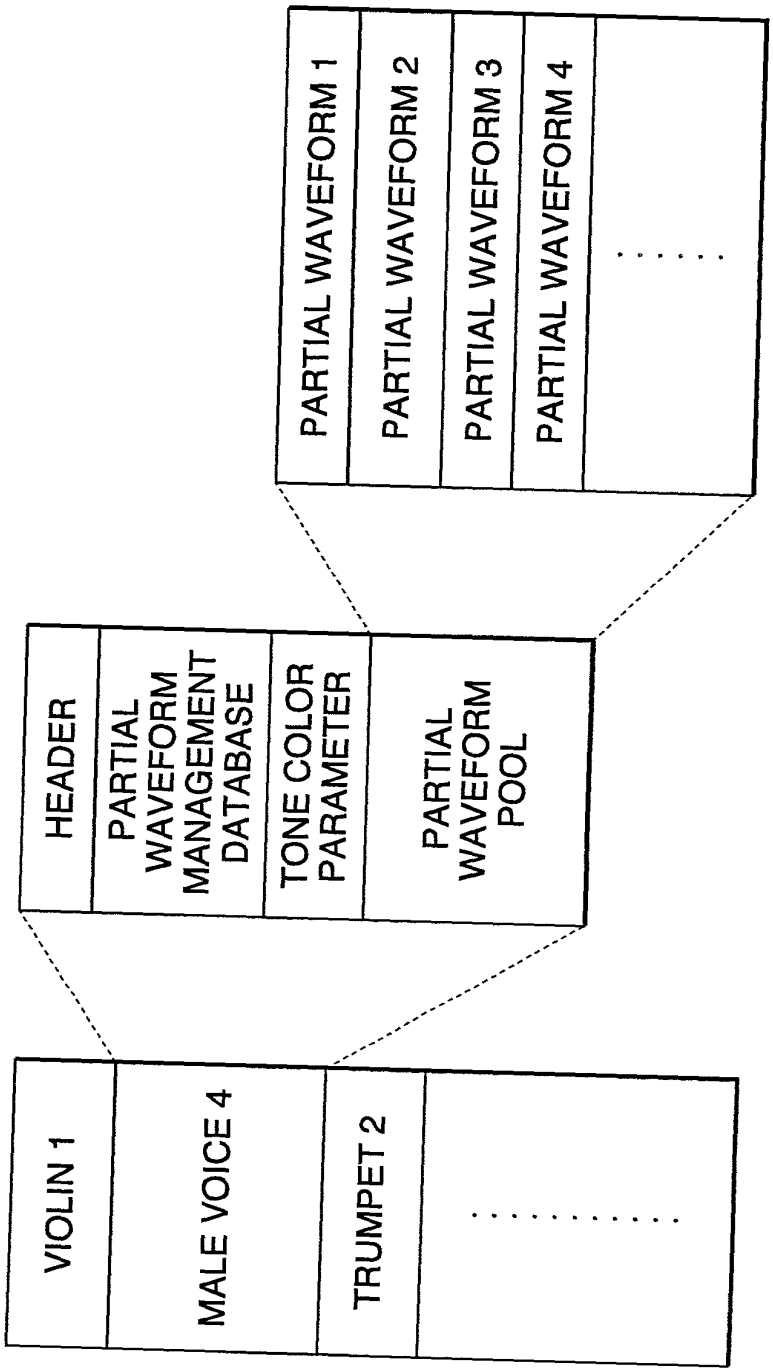

PERFORMANCE DATA
PHRASE WAVEFORM MANAGEMENT INFORMATION
PARTIAL WAVEFORM MANAGEMENT INFORMATION (INCLUDING PROPERTY INFORMATION)
TONE COLOR MANAGEMENT INFORMATION
PHRASE WAVEFORM 1
PHRASE WAVEFORM 2
PHRASE WAVEFORM 3
PARTIAL WAVEFORM 1-1
PARTIAL WAVEFORM 1-2
PARTIAL WAVEFORM 1-3
PARTIAL WAVEFORM 1-4
PARTIAL WAVEFORM 1-5
PARTIAL WAVEFORM 1-6

FIG. 6


VIOLIN 1
MALE VOICE 4
TRUMPET 2
.....
HEADER
PARTIAL WAVEFORM MANAGEMENT DATABASE
TONE COLOR PARAMETER
PARTIAL WAVEFORM POOL
PARTIAL WAVEFORM 1
PARTIAL WAVEFORM 2
PARTIAL WAVEFORM 3
PARTIAL WAVEFORM 4
.....

Title: Waveform Generating Method, Performance Data...
Inventor: Masahiro SHIMIZU et al.
Application No.: Not yet assigned
Docket No.: 393032030600

FIG. 7

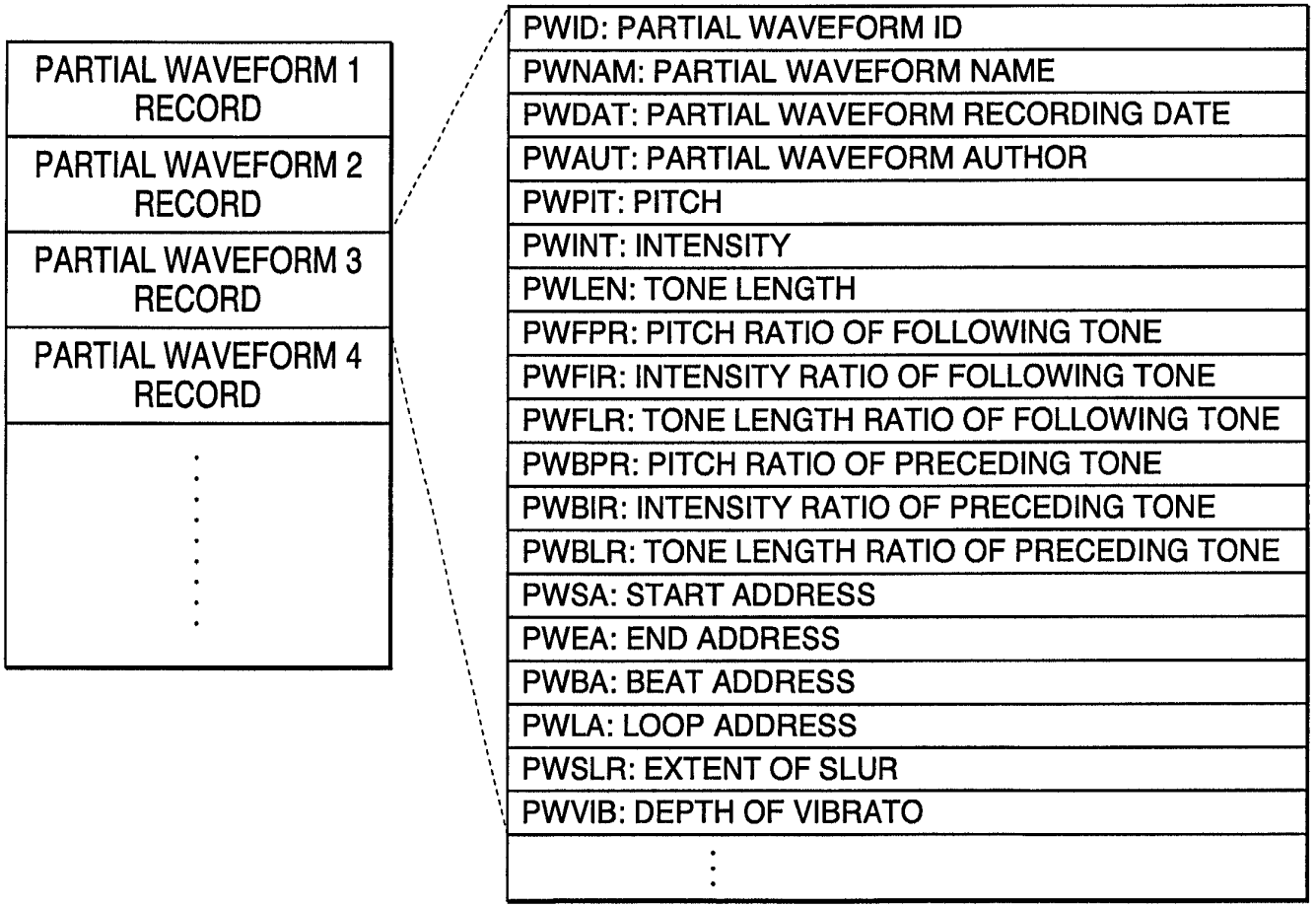


FIG. 8

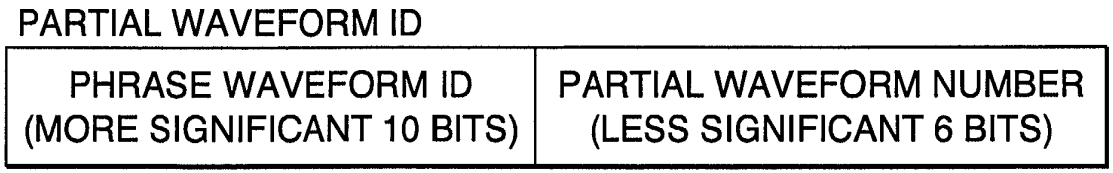


FIG. 9

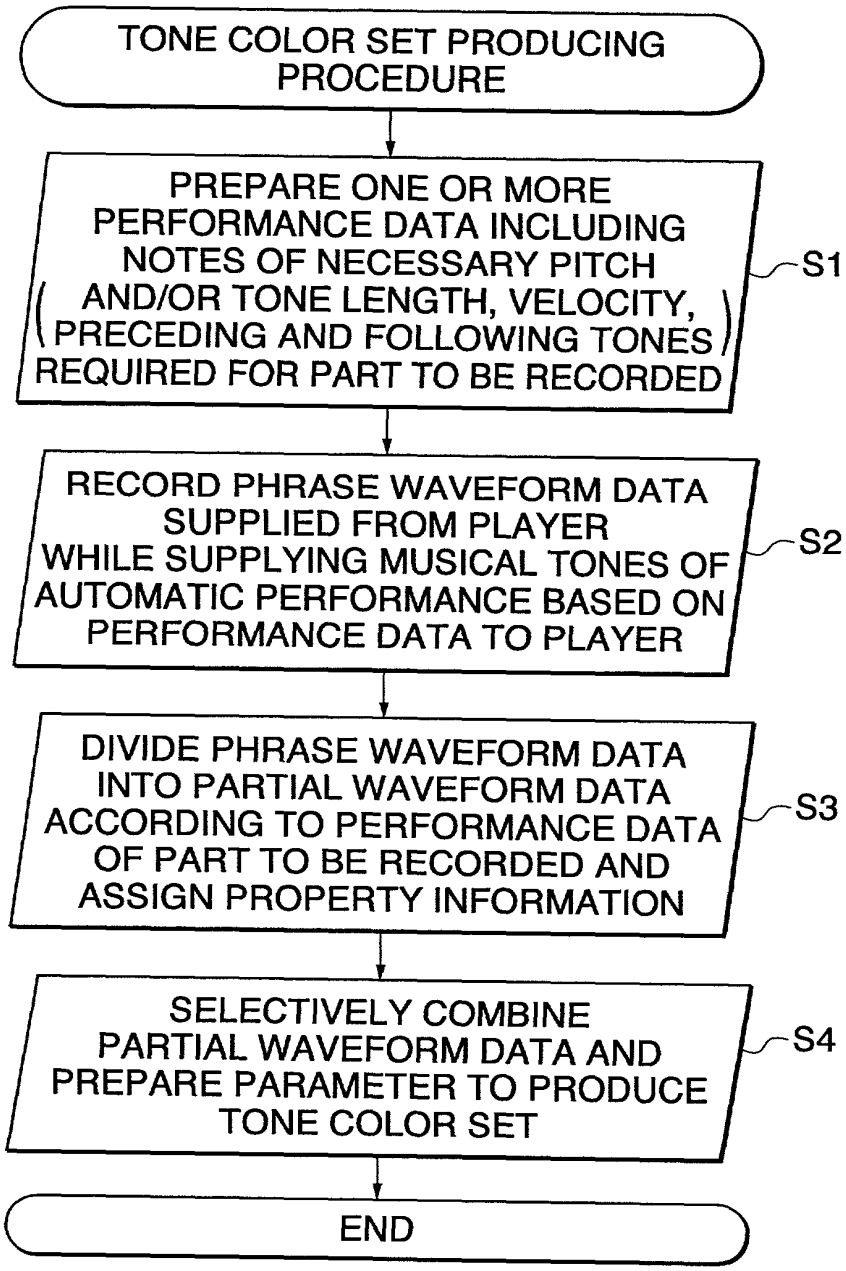

TONE COLOR SET PRODUCING PROCEDURE
PREPARE ONE OR MORE PERFORMANCE DATA INCLUDING NOTES OF NECESSARY PITCH AND/OR TONE LENGTH, VELOCITY, PRECEDING AND FOLLOWING TONES REQUIRED FOR PART TO BE RECORDED
S1
RECORD PHRASE WAVEFORM DATA SUPPLIED FROM PLAYER WHILE SUPPLYING MUSICAL TONES OF AUTOMATIC PERFORMANCE BASED ON PERFORMANCE DATA TO PLAYER
S2
DIVIDE PHRASE WAVEFORM DATA INTO PARTIAL WAVEFORM DATA ACCORDING TO PERFORMANCE DATA OF PART TO BE RECORDED AND ASSIGN PROPERTY INFORMATION
S3
SELECTIVELY COMBINE PARTIAL WAVEFORM DATA AND PREPARE PARAMETER TO PRODUCE TONE COLOR SET
S4
END

FIG. 10

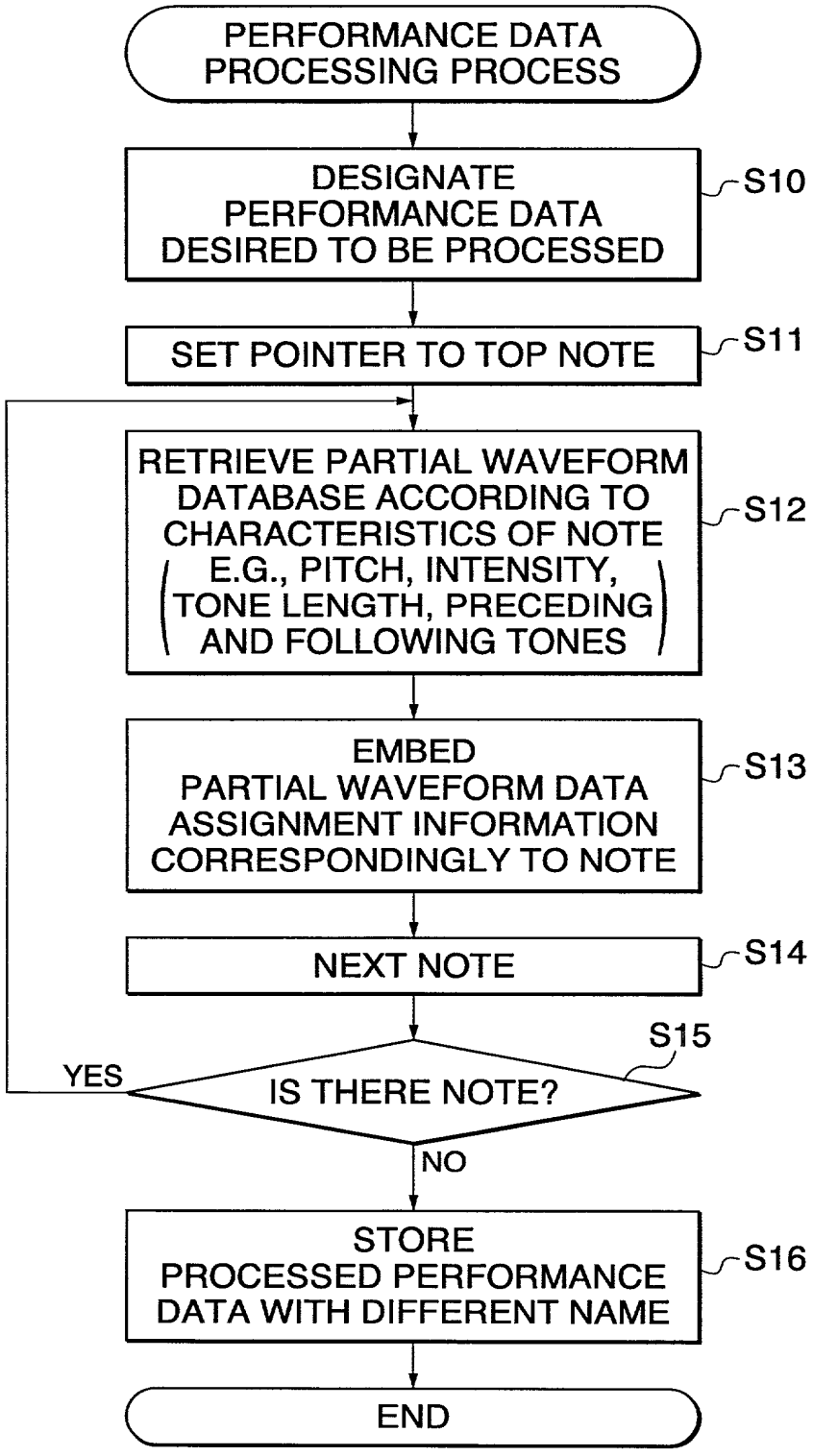

PERFORMANCE DATA PROCESSING PROCESS
DESIGNATE PERFORMANCE DATA DESIRED TO BE PROCESSED
S10
SET POINTER TO TOP NOTE
S11
RETRIEVE PARTIAL WAVEFORM DATABASE ACCORDING TO CHARACTERISTICS OF NOTE (E.G., PITCH, INTENSITY, TONE LENGTH, PRECEDING AND FOLLOWING TONES)
S12
EMBED PARTIAL WAVEFORM DATA ASSIGNMENT INFORMATION CORRESPONDINGLY TO NOTE
S13
NEXT NOTE
S14
S15
IS THERE NOTE?
YES
NO
STORE PROCESSED PERFORMANCE DATA WITH DIFFERENT NAME
S16
END

FIG. 11

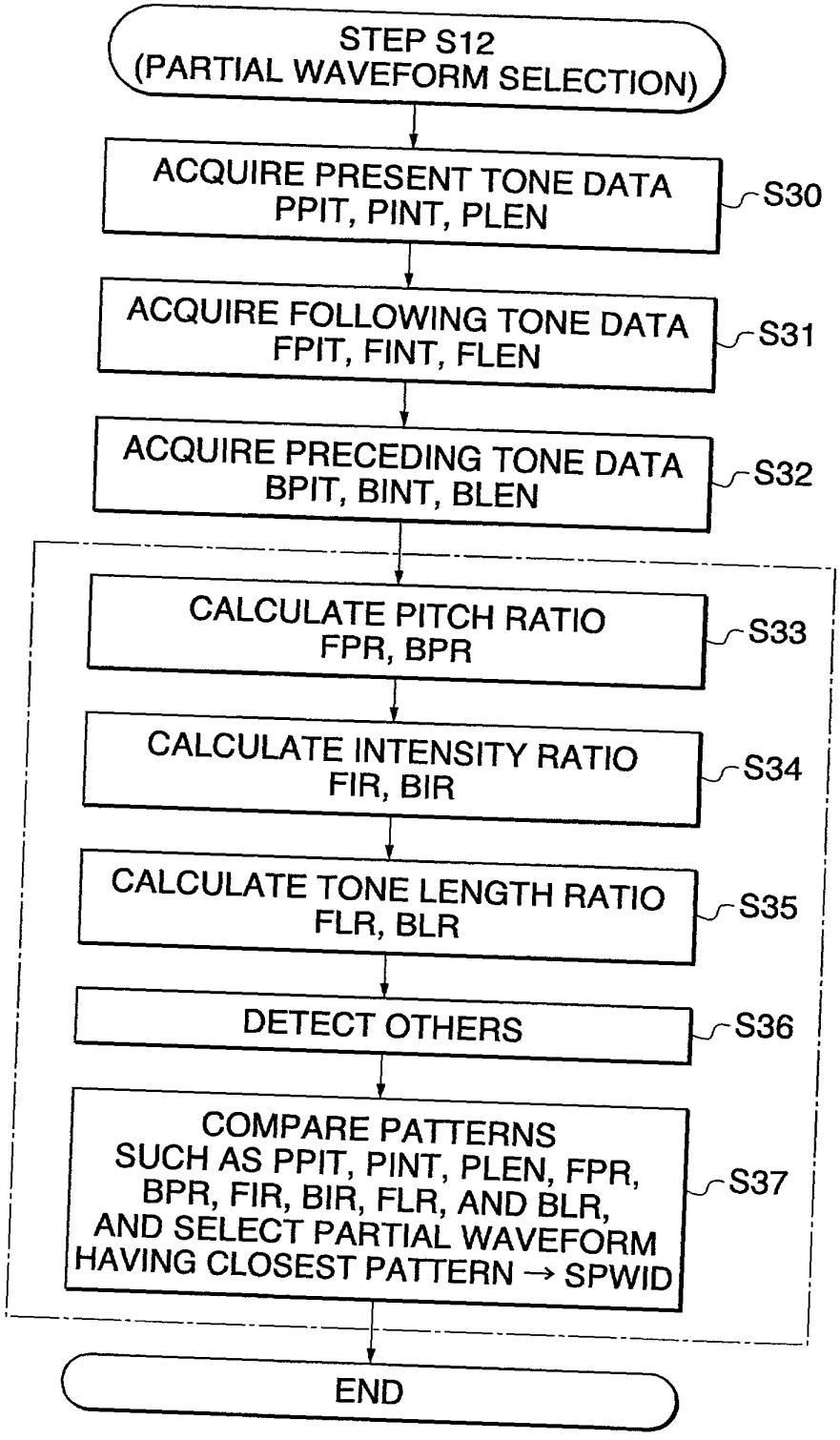

STEP S12
(PARTIAL WAVEFORM SELECTION)
ACQUIRE PRESENT TONE DATA
PPIT, PINT, PLEN
S30
ACQUIRE FOLLOWING TONE DATA
FPIT, FINT, FLEN
S31
ACQUIRE PRECEDING TONE DATA
BPIT, BINT, BLEN
S32
CALCULATE PITCH RATIO
FPR, BPR
S33
CALCULATE INTENSITY RATIO
FIR, BIR
S34
CALCULATE TONE LENGTH RATIO
FLR, BLR
S35
DETECT OTHERS
S36
COMPARE PATTERNS
SUCH AS PPIT, PINT, PLEN, FPR,
BPR, FIR, BIR, FLR, AND BLR,
AND SELECT PARTIAL WAVEFORM
HAVING CLOSEST PATTERN → SPWID
S37
END

FIG. 12

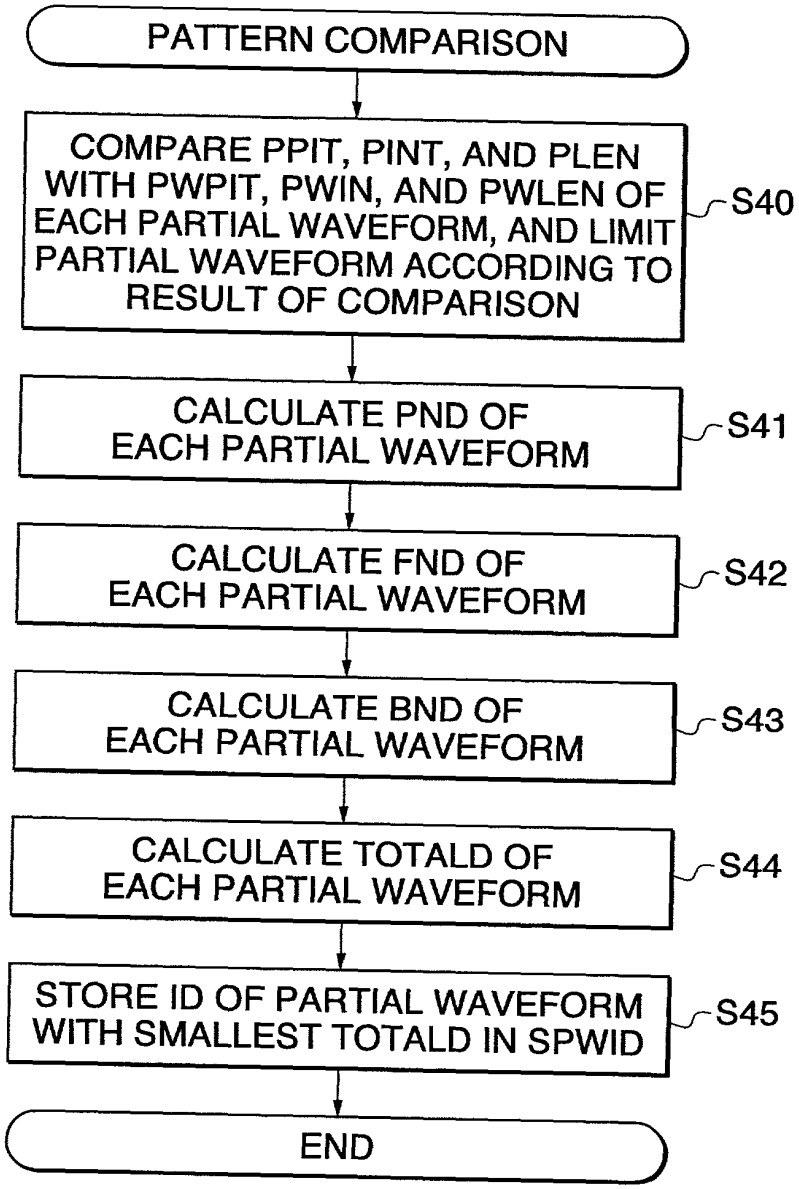

PATTERN COMPARISON
COMPARE PPIT, PINT, AND PLEN WITH PWPIT, PWIN, AND PWLEN OF EACH PARTIAL WAVEFORM, AND LIMIT PARTIAL WAVEFORM ACCORDING TO RESULT OF COMPARISON
S40
CALCULATE PND OF EACH PARTIAL WAVEFORM
S41
CALCULATE FND OF EACH PARTIAL WAVEFORM
S42
CALCULATE BND OF EACH PARTIAL WAVEFORM
S43
CALCULATE TOTALD OF EACH PARTIAL WAVEFORM
S44
STORE ID OF PARTIAL WAVEFORM WITH SMALLEST TOTALD IN SPWID
S45
END

FIG. 13

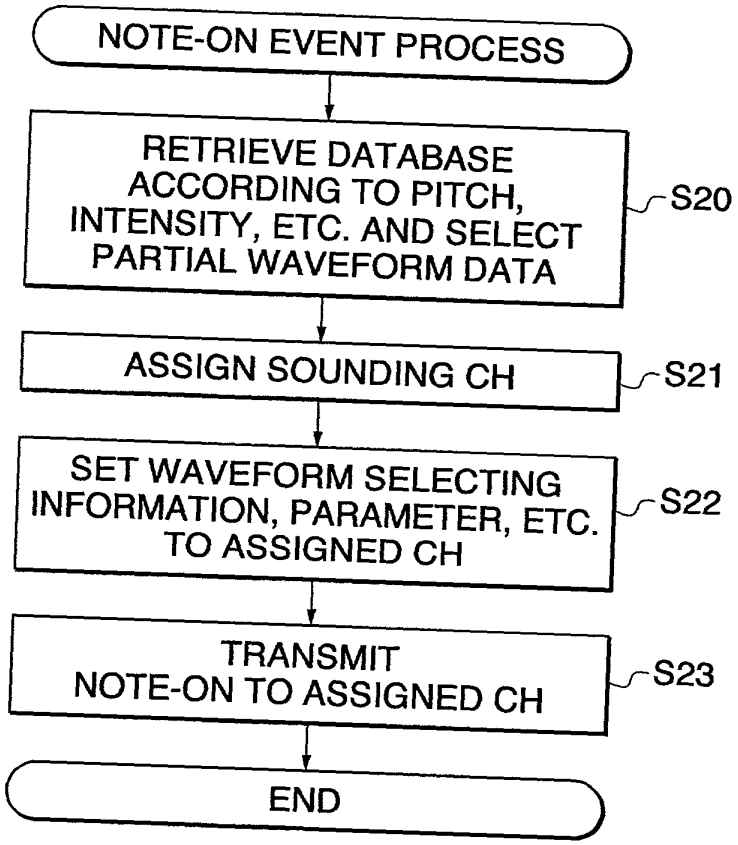

NOTE-ON EVENT PROCESS
RETRIEVE DATABASE ACCORDING TO PITCH, INTENSITY, ETC. AND SELECT PARTIAL WAVEFORM DATA
S20
ASSIGN SOUNDING CH
S21
SET WAVEFORM SELECTING INFORMATION, PARAMETER, ETC. TO ASSIGNED CH
S22
TRANSMIT NOTE-ON TO ASSIGNED CH
S23
END

FIG. 14

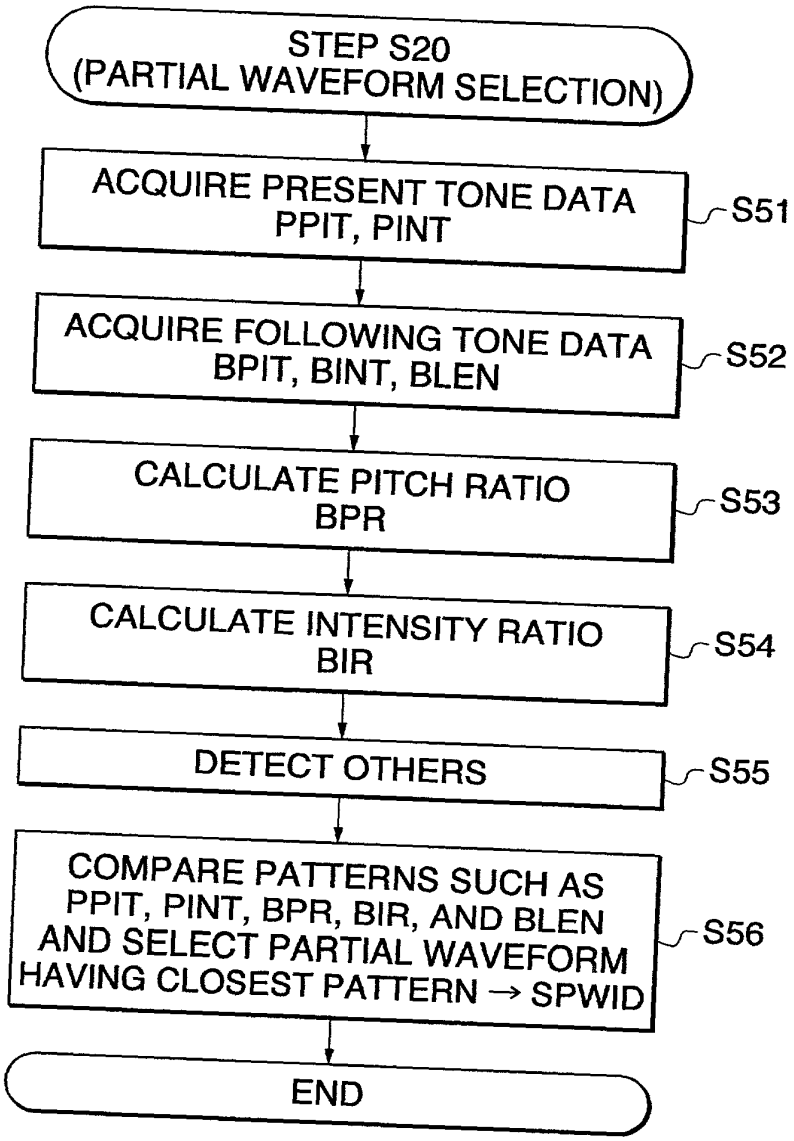

STEP S20
(PARTIAL WAVEFORM SELECTION)
ACQUIRE PRESENT TONE DATA
PPIT, PINT
S51
ACQUIRE FOLLOWING TONE DATA
BPIT, BINT, BLEN
S52
CALCULATE PITCH RATIO
BPR
S53
CALCULATE INTENSITY RATIO
BIR
S54
DETECT OTHERS
S55
COMPARE PATTERNS SUCH AS
PPIT, PINT, BPR, BIR, AND BLEN
AND SELECT PARTIAL WAVEFORM
HAVING CLOSEST PATTERN → SPWID
S56
END

FIG. 15

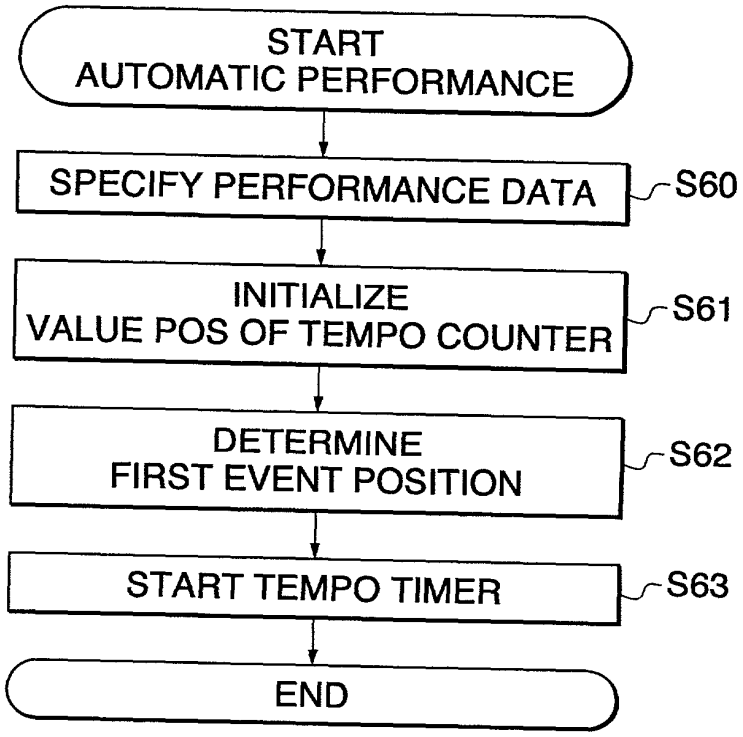

START
AUTOMATIC PERFORMANCE
SPECIFY PERFORMANCE DATA
S60
INITIALIZE
VALUE POS OF TEMPO COUNTER
S61
DETERMINE
FIRST EVENT POSITION
S62
START TEMPO TIMER
S63
END

FIG. 16

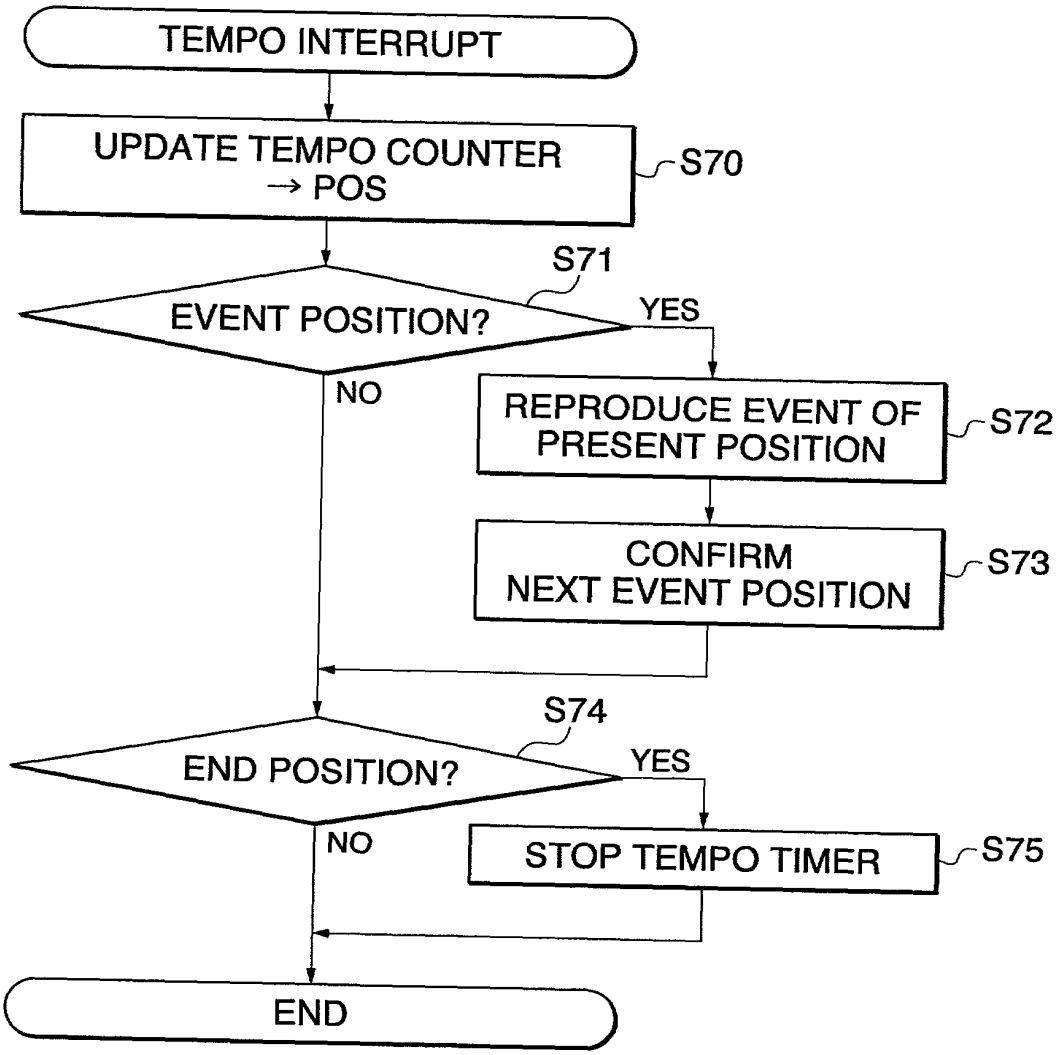
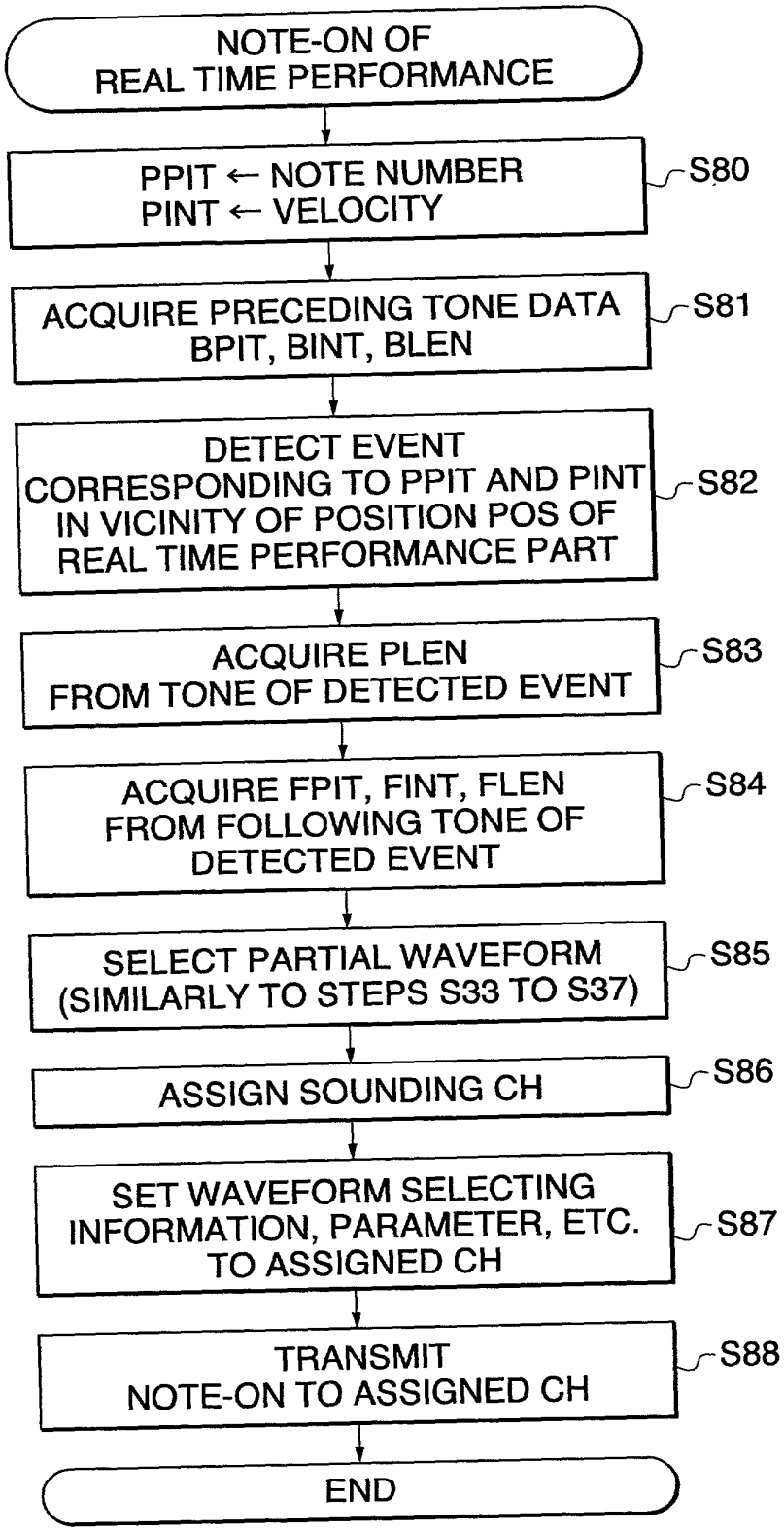

TEMPO INTERRUPT
UPDATE TEMPO COUNTER → POS
S70
S71
EVENT POSITION?
YES
NO
REPRODUCE EVENT OF PRESENT POSITION
S72
CONFIRM NEXT EVENT POSITION
S73
S74
END POSITION?
YES
NO
STOP TEMPO TIMER
S75
END

FIG. 17


NOTE-ON OF REAL TIME PERFORMANCE
PPIT ← NOTE NUMBER
PINT ← VELOCITY
S80
ACQUIRE PRECEDING TONE DATA BPIT, BINT, BLEN
S81
DETECT EVENT CORRESPONDING TO PPIT AND PINT IN VICINITY OF POSITION POS OF REAL TIME PERFORMANCE PART
S82
ACQUIRE PLEN FROM TONE OF DETECTED EVENT
S83
ACQUIRE FPIT, FINT, FLEN FROM FOLLOWING TONE OF DETECTED EVENT
S84
SELECT PARTIAL WAVEFORM (SIMILARLY TO STEPS S33 TO S37)
S85
ASSIGN SOUNDING CH
S86
SET WAVEFORM SELECTING INFORMATION, PARAMETER, ETC. TO ASSIGNED CH
S87
TRANSMIT NOTE-ON TO ASSIGNED CH
S88
END